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THIN-WALL CONTAINER MADE OF PLASTIC

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A thin-wall container 1, 2 of plastic is described, which has a stacking edge to hold an additional, equivalent container with formation of a cavity between the bottoms 11 to hold the fill material, and at least one outwardly projecting, ring-like, reinforcing corrugation 8a, b, c. The ring-like, reinforcing corrugation 8a, b, c is designed so that it remains in stable shape when stacking the containers 1, 2, and the wall section that is located, during stacking of the containers, opposite the ring-like, reinforcing corrugations 8a, b, c is equipped with elongated expansion ribs 14 extending axially across the width of the retaining ring 10. The expansion ribs 14 can be outwardly or inwardly projecting cylindrical protrusions extending axially across the width of the retaining ring 10.

The following data have been taken from documentation submitted by the applicant.

The invention pertains to a thin-wall container, in particular a cup, made of plastic with a perimeter wall widening from the bottom to the upper, opening lip, in which a stacking edge is provided to hold an additional, equivalent container to form a cavity between the bottoms to hold the fill material, and at least one outward-projecting ring-like, reinforcing corrugation that is molded in, wherein the radial outer dimension* of the ring-like, reinforcing corrugation is greater than the minimum, inside diameter of the wall section (opposite the ring-like, reinforcing corrugation) of the equivalent container upon stacking of the containers.

Containers of this type are known from GM 80 07 816, where the corrugations are designed as a kind of piston ring. The radial extension of the corrugation is tailored to ensure a clamping contact of the corrugation with the inner surface of the equivalent container holding the container when stacking them together. Because the wall of the outer container located opposite the corrugation is smooth, and the radius of curvature of the corrugation is large in comparison to the thickness of the material, the corrugations are pressed inward, so that due to the resultant deformation, a large clamping effect is achieved, which, however, makes it more difficult to separate the containers in vending machines.

In addition, containers are known which have a stacking shoulder in the perimeter wall above the bottom, and the shoulder transitions via a slightly anti-conical wall section into a cylindrical wall section. A retaining ring is located above it that has axially extending, outward pointing corrugations that alternate with anti-conically inclined, intermediate wall sections. Since the corrugations and thus the entire retaining ring is not of a flexible design, a relatively large amount of force must be applied to push the stacking shoulders together and push them past the retaining ring until the stacking shoulder snaps into the lower edge of the retaining ring.

This container has the disadvantage that it is difficult to remove individual containers from the stack, and that the fill chamber is only sealed above the stacking shoulder of the inner container, which, as a rule, is not enough to keep the fill material from exiting from the containers when the container stack is turned upside down, which can occur, for example, during improper transport or improper handling in the automated filling machine.

The purpose of the invention is to create a container that can be easily removed from the stack after being stacked together and whose fill chamber is tightly sealed, so that little or none of the fill material can leak out in case of improper or incorrect handling.

This problem is solved by a thin-wall container made of plastic, in which the ring-like, reinforcing corrugation is designed such that when stacking the containers together, it will

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* [Editor's note: "Radial outer dimension" must be interpreted here as "outer dimension measured in the radial direction," or the comparison with the inside diameter of an equivalent cup would be incorrect.]

remain stable in shape, and such that the wall section of the holding container located opposite the ring-like, reinforcing corrugation of the inner container has a retaining ring with elongated expansion ribs extending axially across the width of the retaining ring.

When inserting one such container into another, the fill chamber will be sealed not only in the region of the stacking edge that rests against the inner container, but also across the ring-like, reinforcing corrugation that is not deformed when stacking the containers together. The shape stability of the ring-like, reinforcing corrugation is retained independently of how far the inner container is pressed into the outer container. The ring-like, reinforcing corrugation acting, in cooperation with the retaining ring, as a sealing ring will ensure an adequate sealing of aroma even in case of slippage of the containers during their transport, even if the inner container is no longer resting completely upon the stacking edge of the outer container. The sealing effect will be retained as long as at least one ring-like, reinforcing corrugation is resting against the inner side of the retaining ring of the outer container.

The provision of expansion ribs with which the ring-like, reinforcing corrugation will cooperate when stacking the containers together also has the advantage that the clamping effect will increase continuously with the stacking of the containers one inside the other. Snapping into the end position will not occur, so that easy removal of the individual containers from the stack will be enabled, without having to dispense with good sealing of the fill chamber.

It is possible to equip the retaining ring exclusively with expansion ribs. However, with regard to the sealing effect, it is an advantage to alternate the expansion ribs along the circumference of the retaining ring with elongated intermediate walls extending axially across the width of the retaining ring.

Preferably, these intermediate walls extend parallel to the container axis or are arranged with an outward inclination.

With regard to the expansion ribs, there are two preferred design formats. According to the first embodiment, the expansion ribs have outwardly-projecting cylindrical bulges extending axially across the width of the retaining ring. Due to the conical configuration of the perimeter wall of the container, it is an advantage for the upper portion of the expansion ribs to be inclined conically outward, so that insertion of the inner container will be made easier during stacking and will not be hindered by a step at the upper edge of the retaining ring. Due to the conical inclination of the expansion ribs, the intermediate walls are preferably tapered toward the opening lip. This means that the intermediate walls are of a more narrow design at the upper border of the retaining ring than at the lower border.

Because in this embodiment the intermediate walls rest against the ring-like, reinforcing corrugations, they will act as clamping wall sections. The ring-like, reinforcing corrugation of the container on the inside positioned presses against the intermediate walls and moves them

collectively outward, so that the expansion ribs will stretch while enlarging their radius of curvature. In this embodiment, the ring-like, reinforcing corrugation does not rest against the inside of the expansion rib, so that a small gap will remain, but it will be minimal upon complete insertion of the containers one into the other, due to stretching of the expansion ribs.

According to a second embodiment, the expansion ribs are inward-pointing cylindrical bulges extending axially across the width of the retaining ring. In this embodiment, the expansion ribs rest against the ring-like, reinforcing corrugation of the inner container, so that with increasing insertion of the containers one into the other, the expansion ribs are stretched increasingly. Deformation of the expansion ribs such that they will be made to bulge in an uncontrolled manner does not occur.

As in the first embodiment, the upper portion of the expansion ribs can be inclined conically outward, so that the intermediate walls will likewise be tapered toward the opening lip and accordingly can have a trapezoidal shape. However, in this embodiment, it is also possible for the expansion ribs not to have any inclination at all and to be aligned parallel with the axis, so that the intermediate walls will have a rectangular shape and thus have a constant width across the width of the retaining ring.

It is preferable to locate the retaining ring above the ring-like, reinforcing corrugation. The retaining ring can be separated from the ring-like, reinforcing corrugation by a smooth, cylindrical section of the wall. Preferably, three ring-like, reinforcing corrugations are placed one atop the other, wherein the total width of the ring-like, reinforcing corrugations will be less than the width of the retaining ring. Sealing will be improved with an increased number of ring-like, reinforcing corrugations.

Preferably, the outside diameter of all ring-like, reinforcing corrugations should be of the same size. This is the case, in particular, when the ring-like, reinforcing corrugations are a constituent of the cylindrical wall section below the retaining ring. This design of the ring-like, reinforcing corrugations can be used with vertical or inclined intermediate wall sections according to the first embodiment, or with parallel or inclined expansion ribs according to the second embodiment.

It is also possible, however, to enlarge the outside diameter of the ring-like, reinforcing corrugations from bottom to top, where an adaptation to the slope of the intermediate walls or to the expansion ribs will preferably be performed, in order to ensure proper sealing in the region of the retaining ring when the containers are inserted one into the other.

Preferably, the intermediate walls and the expansion ribs protrude outward with respect to the cylindrical portion of the wall and are designed as inward-pointing stacking shoulders in the transition region to the cylindrical portion of the wall. This offers the advantage that the forces developing in large stacks will be supported not only by the lower stacking shoulder on

which the bottom wall of the inner container is resting, but also by the stacking shoulder at the lower border of the retaining ring. The increased axial pressure will thus be uniformly distributed. In addition, additional sealing of the fill chamber will be created in this region.

Sample embodiment of the invention will be explained in greater detail below based on the illustrations.

We have:

Figure 1 A side view of a cup according to a first embodiment

Figure 2 A vertical cross section through two cups inserted one into the other, according to the embodiment illustrated in Figure 1

Figure 3a The region X indicated in Figure 2 shown on an enlarged scale.

Figure 3b An illustration like that in Figure 3a of an additional embodiment

Figure 4 A horizontal cross section through the cup illustrated in Figure 1 along the line IV-IV

Figure 5 A horizontal cross section as in Figure 4, through two cups inserted one into the other

Figure 6 An enlarged illustration of a vertical cross section through two cups inserted one into the other, according to a second embodiment

Figure 7 A horizontal cross section through one of the cups shown in Figure 6, and

Figure 8 A horizontal cross section along the line VIII-VIII through the two cups illustrated in Figure 6 inserted one into the other

Figure 1 presents a side view of a container 1 in the shape of a cup according to a first embodiment of the invention. The bottom wall 11 is slightly constricted up to the edge region and continues upward in an anticonical wall section 5 that ends in an inward-pointing projecting in the form of a stacking edge 6. Above this there is a region with three ring-like, reinforcing corrugations 8a, b, c, all of which have the same outside diameter in the illustration presented here. Above the ring-like, reinforcing corrugations 8a, b, c there is a cylindrical wall section 9 that adjoins the retaining ring 10, which has a number of expansion ribs 14 that alternate with intermediate walls 12. The perimeter wall 3 extending above the retaining ring 10, is provided with steps 7a, b, c, d, which simplify the engaging and holding of the cup. The opening lip 4 is curved outward and forms a user-friendly rolled edge.

The expansion ribs 14 are designed as outwardly-projecting, cylindrical protrusions, which are somewhat inclined conically upward and outward. The longitudinal axes of the cylindrical protrusions of the expansion ribs 14 thus do not run parallel to the longitudinal axis 16 of the cup. Due to this conical slope of the expansion ribs 14, the intermediate walls 12 have a trapezoidal configuration, and the width of the intermediate walls 12 is upwardly decreasing. The

intermediate walls 12 run essentially parallel to the longitudinal axis 16 and do not have a conical form.

Figure 2 presents two cups 1, 2 placed one inside the other and shown in horizontal cross section. The inner cup 1 rests with the edge of its bottom 11 against the stacking shoulder 6 of the outer cup 2. In the region X it is evident that the ring-like, reinforcing corrugations 8a, b, c rest against the intermediate walls 12.

In Figure 3a we see the region denoted by the X on a larger scale. It is quite evident that the intermediate walls 12 are collectively pressed outward by the ring-like, reinforcing corrugations 8a, b, c, and that no individual deformation of the intermediate walls 12 occurs in the region of the individual ring-like, reinforcing corrugations 8a, b, c. It is also evident that the ring-like, reinforcing corrugations 8a, b, c in this case remain stable in shape and are not pressed in. The conical form of the expansion ribs 14 is likewise illustrated, and has an angle α of 3°.

The intermediate walls 12 pass upward into a slanting wall section 15 that makes it easier to insert the inner cup. When placing one cup inside the other, this slanting wall section 15 cooperates with the convex wall section 17 located between stacking shoulder 6 and lower ring-like, reinforcing corrugation 8c.

In the lower region the intermediate wall 12 and the expansion rib 14 likewise transition into a convex wall section 18, which forms an additional stacking shoulder 13 in the transition region to the cylindrical wall section 9. When in the stacked state with cups placed one inside the other, the convex region 17 rests upon this additional stacking shoulder 13. Thus sealing occurs not only along the stacking shoulder 6, but also along the stacking shoulder 13 and the three ring-like, reinforcing corrugations 8a, b, c that rest against the inside of the intermediate walls 12.

Figure 3b presents an additional embodiment of the invention, which differs from that of Figure 3a in that as the expansion ribs 14 are aligned parallel with the longitudinal axis 16.

Expansion of the expansion ribs 14 will be explained with reference to Figures 4 and 5. In Figure 4 we see a horizontal cross section through a single, unstressed cup. The intermediate walls 12 feature a radius of curvature r_1, and the circumferential extent of the intermediate walls 12 is denoted by B. Between the intermediate walls 12 there are the protrusions of the expansion ribs 14; these protrusions are pointing outward and have the shape of a partial cylinder. The depth of the expansion ribs 14 is denoted by the dimension t_1.

If a cup 2 is inserted into this cup 1 as just described, then the former presses from the inside with its ring-like, reinforcing corrugations 8a, b, c against the intermediate wall 12, and presses it outward. Because the outside radius of the ring-like, reinforcing corrugations is described by the radius r_2, then the retaining ring 10 of the outer cup 1 must be expanded accordingly so that the inner radius will likewise correspond to r_2. In this process the

intermediate walls 12 cannot stretch, so that the dimension B is retained. However, stretching of the expansion ribs 14 does occur, so that the depth of the expansion ribs decreases from the dimension t_1 to the dimension t_2. This means that the required increase in circumference is counteracted by a change in the radius of curvature of the ring-like, reinforcing corrugations.

An additional embodiment is illustrated in Figure 6, such that the expansion ribs 14 of the outer cup 21 are designed as inward-pointing protrusions. The ring-like, reinforcing corrugations 8a, b, c of the interior cup 20 thus rest against the expansion ribs 14 of the outer cup 21. In this embodiment as well, the expansion ribs 14 are collectively pressed outward, without any notable deformation of the expansion ribs 14 taking place. The ring-like, reinforcing corrugations 8a, b, c also remain stable in shape.

The slanting wall section 15 has two segments 22a, b angled toward each other, and the section 22b is steeper than the section 22a. Thus, insertion of the inner cup 20 is made easier.

Figure 7 presents a horizontal cross section through one such cup 20 in the region of the ring-like, reinforcing corrugations 8a, b, c. The width of the intermediate walls 12 is also denoted by B and the depth of the expansion ribs 14 is marked by the dimension t_1. Now r_1 describes the radius of the inner, enveloping expansion rib 14. When inserting the two cups, one cup into the other as is illustrated in Figure 8, an expansion takes place to the inner radius r_2, so that the dimension B is also retained and the expansion ribs 14 are stretched, so that their depth is reduced to the dimension t_2. As is evident from Figure 8, no denting of the expansion ribs 14 occurs, but rather only a stretching.

List of reference symbols

1	Container
2	Container
3	Perimeter wall
4	Opening lip
5	Anti-conical wall section
6	Stacking edge
7a, b, c, d	Steps
8a, b, c	Ring-like, reinforcing corrugation
9	Cylindrical wall section
10	Retaining ring
11	Bottom wall
12	Intermediate wall
13	Stacking shoulder
14	Expansion rib

15	Slanting wall section
16	Container axis
17	Convex wall section
18	Convex wall section
20	Cup
21	Cup
22a, b	Segment

Claims

1. Thin-wall container, in particular a cup, made of plastic with a perimeter wall widening from the bottom to the upper, opening lip, in which a stacking edge is provided to hold an additional, equivalent container to form a cavity between the bottoms to hold the fill material, and at least one outwardly projecting ring-like, reinforcing corrugation that is molded in, wherein the radial outer dimension of the ring-like, reinforcing corrugation is greater than the minimum, inside radius of the wall section (opposite the ring-like, reinforcing corrugation) of the equivalent container upon stacking of the containers, characterized in that the ring-like, reinforcing corrugation (8a, b, c) is designed so that during stacking of the containers (1,2,20,21) it remains stable in shape, and so that the wall section has a retaining ring (10) with elongated expansion ribs (14) extending axially across the width of the retaining ring (10).

2. Container according to Claim 1, characterized in that the expansion ribs (14) alternate, along the circumference of the retaining ring (10), with elongated intermediate walls (12) extending axially across the width of the retaining ring (10).

3. Container according to Claim 1 or 2, characterized in that the intermediate walls (12) extend parallel to the container axis (16).

4. Container according to Claim 1 or 2, characterized in that the intermediate walls (12) are inclined outward.

5. Container according to one of Claims 1 to 4, characterized in that the expansion ribs (14) are outwardly-projecting cylindrical protrusions extending axially across the width of the retaining ring (10).

6. Container according to one of Claims 1 to 5, characterized in that the upper portions of the expansion ribs (14) are inclined conically outward.

7. Container according to one of Claims 1 to 3, characterized in that the intermediate walls (12) are tapered toward the opening lip (4).

8. Container according to one of Claims 1 to 7, characterized in that the intermediate walls (12) have a trapezoid-shaped surface.

9. Container according to one of Claims 1 to 4, characterized in that the expansion ribs (14) are inwardly-projecting cylindrical protrusions extending axially across the width of the retaining ring (10).

10. Container according to Claim 9, characterized in that the expansion ribs (14) are arranged to be parallel to the container axis (16).

11. Container according to Claim 9, characterized in that the expansion ribs (14) are arranged to be inclined outward.

12. Container according to Claim 9 or 10, characterized in that the intermediate walls (12) have a constant width.

13. Container according to one of Claims 9, 10 or 12, characterized in that the intermediate walls (12) have a rectangular surface area.

14. Container according to one of Claims 1 to 13, characterized in that the retaining ring (10) is located above the ring-like, reinforcing corrugation (8a, b, c,).

15. Container according to one of Claims 1 to 14, characterized in that the retaining ring (10) is separated from the ring-like, reinforcing corrugation (8a, b, c,) by a smooth cylindrical wall section (9).

16. Container according to one of Claims 1 to 15, characterized in that three ring-like, reinforcing corrugations (8a, b, c,) are positioned one above the other, wherein the total width of the ring-like, reinforcing corrugations (8a, b, c,) is less than the width of the retaining ring (10).

17. Container according to one of Claims 1 to 16, characterized in that the outside diameter of all the ring-like, reinforcing corrugations (8a, b, c,) is the same.

18. Container according to one of Claims 1 to 16, characterized in that the outside diameter of the ring-like, reinforcing corrugations (8a, b, c,) increases from bottom to top.

19. Container according to one of Claims 1 to 18, characterized in that the intermediate walls (12) and the expansion ribs (14) project outward by comparison to the cylindrical wall section (9) and are designed as inwardly-pointing, stacking shoulders (13) at the transition region to the cylindrical wall section (9).